

REFINING DEEP-SEA HABITAT CLASSIFICATION SCHEMES BASED ON RECENT SURVEYS IN MALTESE WATERS

Annalucia Cantafaro ^{1*}, Ricardo Aguilar ², Silvia Garcia ², Leyla Knittweis ¹ and Julian Evans ¹
¹ Department of Biology, University of Malta, Msida MSD2080, Malta - annalucia.cantafaro.18@um.edu.mt
² Fundacion Oceana, Gran Via 59, 28013 Madrid, Spain

Abstract

ROV imagery is leading to the discovery of diverse deep-sea habitat types in the Malta Fisheries Management Zone (FMZ) at depths of 200 to 1000 meters. These include rocky bottoms with mixed assemblages dominated by cold-water corals and gorgonians, as well as sponges with both encrusting and erect growth habits. Vast expanses of different types of soft-bottom habitats are also present, mostly dominated by Anthozoa, Foraminifera and/or burrowing infauna. New habitat categories will need to be added to the existing habitat classification schemes for the deep Mediterranean Sea, including those of the European Nature Information System (EUNIS), and the Regional Activity Centre for Specially Protected Areas (RAC/SPA), to accommodate some of these discoveries.

Keywords: *Biodiversity, Deep sea ecology, Zoobenthos, Sicily Channel*

Introduction

Deep-sea habitats are less studied than their shallow-water counterparts. This has led to a paucity of deep-sea habitat types included in existing classification systems such as the EUNIS and UNEP-MAP-RAC/SPA schemes, although there are ongoing efforts to update these schemes in light of new knowledge on the deep sea [1]. Recent ROV surveys of deep-sea areas around the Maltese Islands resulted in the discovery of highly diverse habitats, including extensive rocky areas dominated by living cold-water corals and gorgonians at depths of 300–1000 m, a sub-fossil lithistid sponge reef at a depth of ca. 300 m, deep-water caves located at 270–450 m, and vast expanses of soft-bottom habitats, each of which had a rich variety of associated fauna [2]. Here we report on other habitat types which are currently not listed in existing classification schemes, based on recent discoveries made whilst analysing extensive video footage recorded in the Malta FMZ.

Material and Methods

During June–July 2015 and 2016, deep-sea areas between 200–1000 m depth in the Malta FMZ were surveyed by the R/V ‘Oceana Ranger’ using a Saab Seaeye Falcon DR ROV as part of the ‘LIFE BaHAR for N2K’ (‘Benthic Habitat Research for Marine Natura 2000 Site Designation’, <http://lifebahar.org.mt/>) project.

Results and Discussion

The habitats observed in the ROV footage were classified according to the UNEP-MAP-RAC/SPA scheme as updated in 2017 [1], which is the most comprehensive for Mediterranean deep-sea habitats available to date. Deep-sea habitats recorded from Maltese waters for which there is no close equivalent in the scheme are shown in Table 1.

In the case of hard substrata, the ‘new’ habitats recorded from Maltese waters mostly refer to mixed assemblages with two or more co-dominant species (e.g. *Callogorgia verticillata* and *Leiopathes glaberrima*) that are only included as separate habitats in the 2017 UNEP-MAP-RAC/SPA scheme. In addition, we also include living Scleractinia “reefs” with associated alcyonaceans or anthipatharians, and thanatocoenosis of corals, sponges or brachiopods. Several areas with rocky bottoms characterised by encrusting and small globular sponges were also recorded in the ROV footage. These are not included in Table 1 due to the difficulty in identifying sponges from videos, but these bottom types are also missing in existing schemes that mainly refer to large erect sponges. For soft bottoms, the ‘new’ habitats recorded from Maltese waters are ones characterised by burrowing infauna, as evidenced by abundant burrow openings seen in ROV footage, as well as habitats with co-dominant species not included in existing schemes (e.g. *Pelosina arborescens* and *Stylocordyla pellita*). A new bathyal soft-bottom habitat characterised by the hydrozoan *Lytocarpia myriophyllum* is also proposed.

The present results show that as new areas of the Mediterranean are explored, new habitats and combinations of characterising species are to be expected, necessitating regular revision to habitat classification schemes. Considering the variety of additional mixed assemblages discovered from Maltese waters,

existing schemes may however need to be revised to remove mixed assemblages, in order to avoid excessively cumbersome classification systems. Habitats with more than one dominant species could then simply be classified as areas with a mixture of two facies/assemblage types. A better understanding of the presence and distribution of such habitats is essential in order to draft monitoring and management plans for the deep sea.

Tab. 1. Deep-sea habitat types observed in Maltese waters not yet included in the 2017 UNEP-MAP-RAC/SPA scheme [1].

Hard bottom

Bathyal rock with *Bebryce mollis* and *Chironophthya mediterranea*

Bathyal rock with *Callogorgia verticillata* and *Leiopathes glaberrima*

Bathyal rock with *Madrepora oculata* and/or *Lophelia pertusa* and/or *Desmophyllum dianthus* with *Leiopathes glaberrima* and with *Pachastrella monilifera* and/or *Poecillastra compressa*

Bathyal *Madrepora oculata* and/or *Lophelia pertusa* and/or *Desmophyllum dianthus* “reefs” with *Callogorgia verticillata*

Bathyal *Madrepora oculata* and/or *Lophelia pertusa* and/or *Desmophyllum dianthus* “reefs” with *Leiopathes glaberrima*

Thanatocoenosis of corals, sponges or brachiopods

Soft bottom

Bathyal muds with *Swiftia* sp.

Bathyal sediment with *Lytocarpia myriophyllum*

Bathyal sediment with *Pelosina arborescens* and burrowing infauna

Bathyal sediment with *Pelosina arborescens* and *Stylocordyla pellita*

Bathyal sediment with *Isidella elongata* and burrowing infauna

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